

Distribution of African Grass Owl *Tyto capensis* in southern Africa: survey priorities for Gauteng province

Craig A. Whittington-Jones^a, Sean West^a and Doug M. Harebottle^b

Distribution de l'Effraie du Cap *Tyto capensis* en Afrique australe : priorités d'inventaire pour la province de Gauteng. Les données concernant la distribution historique de l'Effraie du Cap *Tyto capensis* ont été collationnées et une carte de répartition de l'espèce dans la province de Gauteng, Afrique du Sud, a été établie pour quatre périodes (pré-1982, 1982–91, 1992–2001 et 2002–11). Dans quatre carrés d'un quart de degré (CQD) l'espèce a été observée dans le passé, mais pas pendant la dernière décennie. Ces derniers ont été marqués comme prioritaires pour des inventaires complémentaires, sur la base de la proximité de CQD avec des données sûres pour cette période et le temps écoulé depuis que l'espèce fut observée pour la dernière fois dans les CQD vides. L'échelle approximative de l'analyse masque les effets de la perte continue d'habitat et sa fragmentation et dégradation. Bien que l'Effraie du Cap demeure une nicheuse sédentaire répandue dans la province, elle est maintenant rarement rencontrée dans une région où elle était considérée comme localement commune il y a 50 ans.

Summary. Historical distribution records for the African Grass Owl *Tyto capensis* were collated and the range of the species in Gauteng province, South Africa, was mapped over four time intervals (i.e. pre-1982, 1982–91, 1992–2001 and 2002–11). Four Quarter Degree Squares (QDS) for which the species was recorded historically, but not during the last decade, were identified as gaps and these were prioritised for follow-up surveys on the basis of proximity to QDS with confirmed records over this period and the time elapsed since the species was last recorded in the gap QDS. The coarse scale of the analysis masked the effects of ongoing habitat loss, fragmentation and degradation, and while African Grass Owls remain widespread breeding residents in the province, they are now rarely encountered in a region where they were considered locally common 50 years ago.

The African Grass Owl *Tyto capensis* (hereafter Grass Owl) is listed as Vulnerable in the most recent South African Red List assessment for birds (Barnes 2000). The rationale for this assessment was given as the small regional population (estimated at <5,000 mature individuals) and the rapid and ongoing destruction of the species' preferred rank grassland and wetland habitat, particularly in the provinces of KwaZulu-Natal and Mpumalanga. This was estimated to have led to a population decline exceeding 10% over the ten years or three generations preceding the assessment. A further decline of >20% over the ten years or three generations following the assessment was projected on the basis of decline in extent of occurrence (essentially Grass Owl distribution measured using a minimum convex polygon to encompass known, inferred or projected sites of present occurrence), area of occupancy (the area within the extent of occurrence that is occupied) and / or quality of habitat.

Grass Owls are nocturnal and rarely encountered alive during daylight hours, except when accidentally or deliberately flushed from

a roost or nest site, so in the absence of a measure of observer effort, reporting rate is not a useful tool for assessing population fluctuations. Consequently, the absence of records for a given area and time period does not necessarily indicate a population decline or range contraction, but may rather reflect a lack of appropriate surveys. Conversely, a record for a given area should not be taken as evidence of a healthy local population.

While a formal review of the species' status is long overdue, few estimates of its population density exist (Mendelsohn 1989, Whittington-Jones 2010, Whittington-Jones *et al.* 2011) and these are derived from short-duration studies. Data from which to estimate a regional population and to project population trends are therefore extremely limited and future Red List assessments will, of necessity, depend primarily on a comparison of distribution data from the late 1980s and early 1990s generated by the Southern African Bird Atlas Project (SABAP1) (Harrison *et al.* 1997) and the ongoing second atlas project (SABAP2) to determine whether changes in the extent of occurrence and / or

area of occupancy meet thresholds of concern (IUCN 2001). However, because the distribution and preferred habitat of Grass Owl and Marsh Owl *Asio capensis* overlap, and inexperienced observers may struggle to reliably distinguish the two species, especially in flight, targeted Grass Owl surveys will be necessary to ensure that any apparent changes in distribution between the two atlas periods are supported by good-quality data.

This paper outlines the process whereby gaps (i.e. areas where the species occurred historically, but not during the period 2002–11) in Grass Owl distribution in southern Africa were identified and prioritised in order to direct species-specific survey efforts. This first, in a planned series of analyses, focuses on Gauteng, the most urbanised and densely populated province in South Africa, where the species is considered of special conservation concern (GDACE 2004).

Methods

Analysis intervals

The IUCN Red List criteria consider, among other factors, changes in population size, extent of occurrence and area of occupancy of target species over ten-year intervals (IUCN 2001). For the purposes of our analyses, data were therefore divided into four groups, these being historical data (i.e. all records collected prior to 1982) and data collected for each of the subsequent ten years ending in 2011 (i.e. 1982–91, 1992–2001 and 2002–11). Maps of Grass Owl distribution in Gauteng for each of the four time intervals and a composite map that included all dated and undated records, thereby showing the maximum distribution of the species in the province, were generated using Diva-GIS 5.2.

Data sources

Grass Owl distribution data for Gauteng were extracted from the published literature (both scientific and popular), unpublished reports and field datasheets, the archives and collections of the Ditsong National Museum of Natural History (formerly the Transvaal Museum) and the Iziko South African Museum, the databases of the Animal Demography Unit, University of Cape Town (i.e. SABAP1, SABAP2, Birds In Reserves Project [BIRP], Nest Record Card Scheme [NERCS], Coordinated Waterbird Count

[CWAC] and the SAFRING ringing database), Cape Nature, the Gauteng Department of Agriculture and Rural Development (GDARD), the Endangered Wildlife Trust (EWT), Natural World, FreeMe rehabilitation centre and the field notes and databases of many private individuals. Data were consolidated into a single spreadsheet and where duplicate records were identified (i.e. captured from more than one dataset) the available information was consolidated into a single record with a reference to each relevant source. Where coordinates were not provided, these were extrapolated from locality information (where this was sufficiently specific) using geo-referenced Geographic Information System (GIS) maps of the region. Coordinates ranging in accuracy from Global Positioning System (GPS) point data to Quarter Degree Square (QDS) centroid (i.e. *c.* 20 km) were accepted, but records with poor locality (i.e. less than QDS accuracy) and / or date (i.e. not possible to assign to one of the four analysis intervals) resolution were excluded.

The dataset for the atlas of the birds of the former Transvaal province comprised records for the period 1960–86 derived from a variety of sources (Kemp *et al.* 1985, Tarboton *et al.* 1987) and was the main source of distributional data for Gauteng prior to 1982. Through the examination of museum specimens, original atlas datasheets, field notes and references, all but six of these atlas records could be allocated to a particular time period even if the precise date was unknown and despite temporal overlap between the Transvaal atlas and SABAP1. Individually dated records from the SABAP1 dataset were not available for the former Transvaal at the time of this analysis, but atlas data for this region were mainly collected in 1982–91 (Harrison *et al.* 1997). No large-scale bird surveys were undertaken in Gauteng during 1992–2001 and the *ad hoc* collection of museum specimens, ADU monitoring initiatives such as BIRP and CWAC, the long-running NERCS and bird ringing (under the auspices of SAFRING) generated few Grass Owl records for this period.

Collection and collation of Grass Owl distributional data for conservation planning purposes was initiated in 2002 (i.e. at the start of the final time period) and has continued until the present. These data were derived from targeted field surveys in remnant patches of suitable habitat by staff from the Gauteng Directorate of Nature

Conservation, ongoing ADU monitoring projects, reports from conservation NGOs (e.g. Jooste 2003), research projects (Ansara 2004), specialist avifaunal studies conducted as a requirement of Environmental Impact Assessments (EIAs), museum specimens and reports from the birding public. Since 2007 SABAP2 has provided a further important ongoing source of general bird distribution data for the province including some Grass Owl records.

Area of occupancy

Area of occupancy is defined as the area within the extent of occurrence of a species that is occupied by that species (IUCN 2001). It can be measured at a variety of scales, and while the scale should be appropriate to the biology of the species (IUCN 2001) it may be constrained by the

available data. The coarsest data resolution (i.e. the QDS) necessarily dictated the spatial scale at which area of occupancy was calculated for Grass Owl and the actual proportion of each QDS that constituted suitable habitat for the species was unknown.

Provincial boundaries do not follow QDS boundaries and therefore, for the purposes of this analysis, QDS for which 50% or more of the total area fell within the borders of Gauteng were included in their entirety while the remainder (17) were excluded. The excluded QDS will be incorporated into the subsequent analyses for adjacent provinces according to the same principle. In Gauteng each QDS measures approximately 25 km x 28 km with an area of 700 km² or 70,000 ha.



Figure 1. Distribution of Grass Owls *Tyto capensis* in Gauteng (boundary as at 2010), South Africa, for the period 1901–2011.

Répartition de l'Effraie du Cap *Tyto capensis* en Gauteng (limites de 2010), Afrique du Sud, pendant la période 1901–2011.

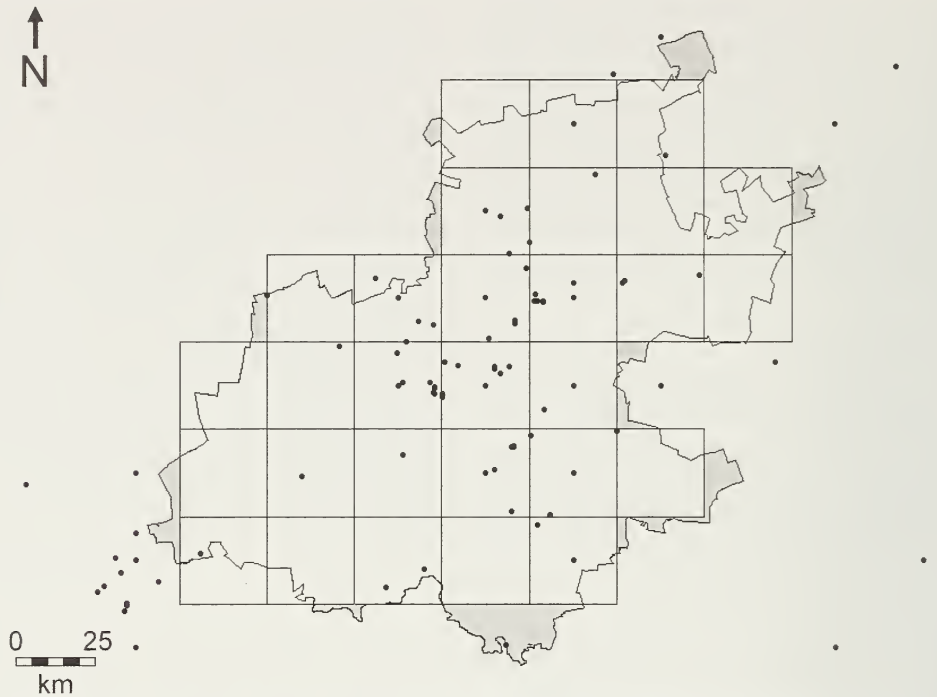


Figure 2. Distribution of Grass Owls *Tyto capensis* in Gauteng (modified to exclude QDS with <50% of area within province), South Africa, for the period prior to 1982.

Répartition de l'Effraie du Cap *Tyto capensis* en Gauteng (modifié afin d'exclure les CQD avec <50% de surface à l'intérieur de la province), Afrique du Sud, pendant la période précédant 1982.

Priority gaps

The current distribution of Grass Owls in Gauteng, mapped using data collected over the last ten years (2002–11), was compared with distribution data for the other three time intervals (i.e. 1992–2001, 1982–91 and prior to 1982). QDS where the species was recorded prior to 2002, but not subsequently were considered to be survey gaps. Gaps were ranked according to distance to the nearest QDS with a current record and then by time elapsed (in years) since the species was last recorded in a given QDS. Since many records were only accurate to the level of QDS centroid, distance was measured in terms of the number of QDS between the gap QDS and the nearest current record (i.e. a gap adjacent to a QDS with a current record scored 0, a gap one QDS away from a current recorded scored 1, etc.). Topocadastral maps, Google Earth satellite imagery, local knowledge and preliminary field visits were then used to refine the priority list further, based on whether or not suitable habitat

for Grass Owls was thought to remain in a gap QDS.

Grass Owls typically roost and nest in the same habitat (Steyn 1982, Tarboton *et al.* 1987) and as such might be expected to breed throughout their recorded distribution in the province. Where evidence of breeding was noted, these records were nevertheless extracted and classified as confirmed (i.e. eggs or nestlings observed) or suspected (roost either occupied or unoccupied, but with a well-developed system of interconnected tunnels). Given the relative paucity of breeding records, the analysis was limited to two periods, i.e. all records collected before 2002 and those collected subsequently.

Results and Discussion

The 2010 boundary of Gauteng encompasses 12 full and 34 partial QDS. Grass Owls were recorded in 41 (89%) of these between 1901 and 2011, although not necessarily within the area currently defined as Gauteng (Fig. 1). Seventeen

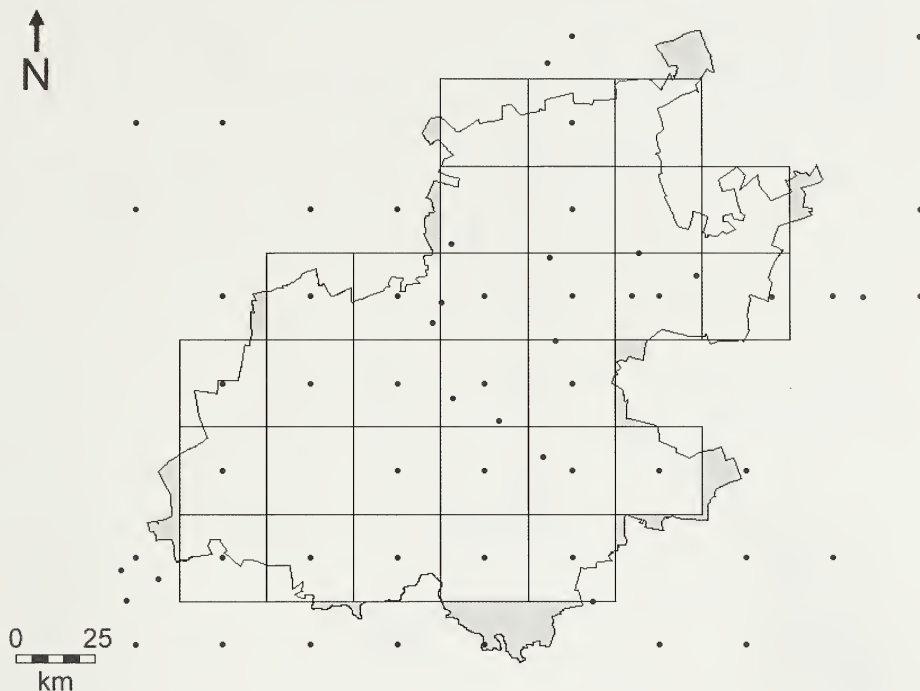


Figure 3. Distribution of Grass Owls *Tyto capensis* in Gauteng (modified to exclude QDS with <50% of area within province), South Africa, for the period 1982–91.

Répartition de l'Effraie du Cap *Tyto capensis* en Gauteng (modifiée afin d'exclure les CQD avec <50% de surface à l'intérieur de la province), Afrique du Sud, pendant la période 1982–91.

of these QDS were excluded from the analysis as <50% of their total area fell within the border of Gauteng (Figs. 2–5). Grass Owls were recorded in 28 of the remaining 29 QDS (96.6%). The concentration of records in the south-central and south-east of the province may be attributed to higher observer effort and does not necessarily reflect better habitat quality or greater Grass Owl population size / density.

Grass Owls were recorded in 21 of 29 (72.4%) QDS included in the analysis prior to 1982 (Fig. 2). Based on QDS alone, this gives a maximum area of occupancy of 14,700 km². Data collection appears to have been strongly biased towards the centre of Gauteng, potentially as a result of the relative proximity to the population centres of Johannesburg and Pretoria, and was undoubtedly stimulated by the initiation of the Transvaal bird atlas.

The launch of SABAP1, increased general bird surveys and reporting across the distribution of the Grass Owl, and the apparent increase in the range of the species in Gauteng during 1982–91

from 21 to 25 QDS (i.e. 86.2%) with a maximum area of occupancy of 17,500 km² is attributed to this change in sampling effort rather than a real range extension (Fig. 3). The QDS-scale reporting approach adopted for SABAP1 creates the impression of a more even distribution of Grass Owls in the province, but sampling biases and differences in habitat suitability undoubtedly persisted over this period.

Table 1. Priority gap QDS ranked according to distance and date when last recorded.

Tableau 1. CQD vides prioritaires classés selon la distance et la date de la dernière observation.

| QDS | Distance to current record (km) | Last recorded | Suitable habitat remaining |
|-------------------|---------------------------------|---------------|----------------------------|
| 2627BD—Grasmere | 0 | 1969 | Yes, management needed |
| 2627BC—Westonaria | 0 | 1966–74 | Yes, very limited extent |
| 2627CB—Klipdrift | 0 | 1976 | Yes |
| 2628CA—Meyerton | 0 | 1982–91 | Yes |

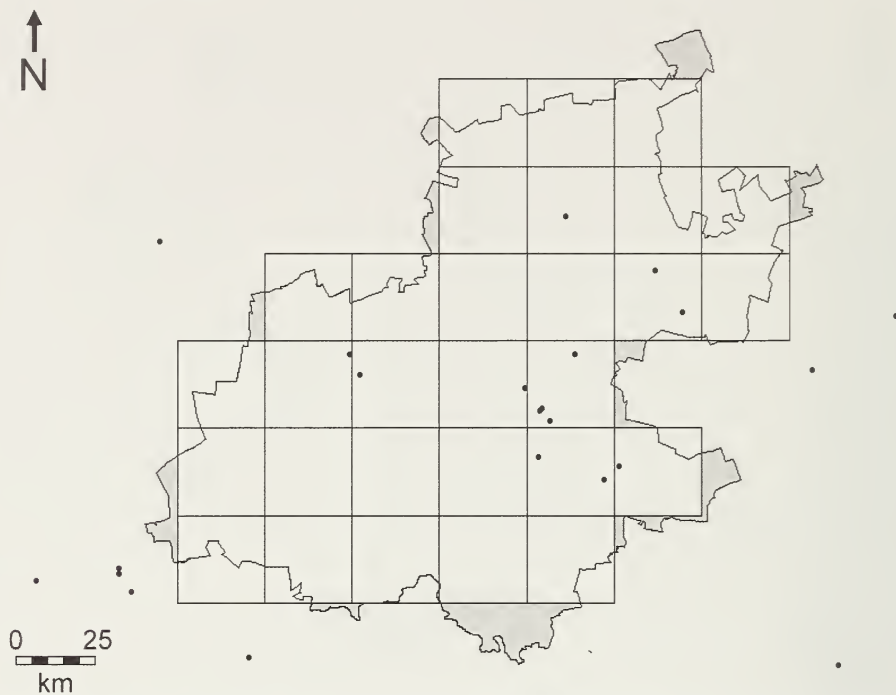


Figure 4. Distribution of Grass Owls *Tyto capensis* in Gauteng (modified to exclude QDS with <50% of area within province), South Africa, for the period 1992–2001.

Répartition de l'Effraie du Cap *Tyto capensis* en Gauteng (modifiée afin d'exclure les CQD avec <50% de surface à l'intérieur de la province), Afrique du Sud, pendant la période 1992–2001.

No formal atlas projects were conducted during 1992–2001 and data were largely limited to incidental collection of museum specimens (Fig. 4). Consequently, the marked decline in the number of QDS for which Grass Owls were recorded (from 25 to eight, or 27.6%) and in the estimated area of occupancy of (5,600 km²) was predictable and does not reflect a real change in the species' distribution. The obvious paucity of data over this period highlights the importance of ongoing structured data collection initiatives as a means of tracking changes in the distribution of threatened species, especially if they are nocturnal or otherwise cryptic.

Over the last decade (2002–11), Grass Owls were recorded in 24 of 29 QDS (82.8%) giving a maximum area of occupancy of 16,800 km² (Fig. 5). Data collection during this period was stimulated by concern over the high number of owls killed on the N17 freeway and surrounding roads (Jooste 2003, Ansara 2004), province-wide biodiversity surveys undertaken by the Gauteng Directorate of Nature Conservation to inform the

development of the provincial conservation plan, the introduction of more rigorous requirements for specialist ornithological studies as a component of EIAs and, most recently, the initiation of SABAP2 (July 2007 to present).

During 2002–11, Grass Owls were recorded in all but four of the QDS included in the study area where they were recorded historically and these are considered to be immediate survey priorities (Table 1). The highest priority is Grasmere QDS, where the species has not been recorded in over four decades, while the lowest priority is Meyerton QDS, where the species has not been recorded in at least two decades. All four gap QDS lie adjacent to QDS where the species has been recorded in the last decade.

While much of Grasmere QDS has been transformed by urban sprawl, a preliminary visit to the area in December 2011 revealed remnants of suitable habitat in the Olifantsvlei Municipal Nature Reserve (essentially a complex of sewage disposal works, settling ponds and cultivated lands along the Kliprivier east of Lenasia) and

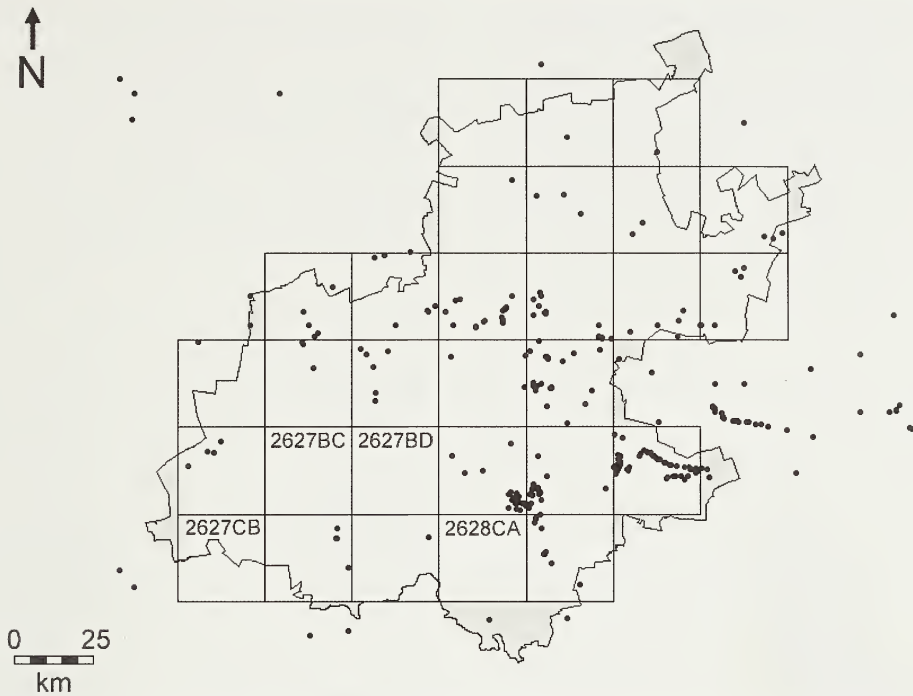


Figure 5. Distribution of Grass Owls *Tyto capensis* in Gauteng (modified to exclude QDS with <50% of area within province), South Africa, for the period 2002–11. Priority gap QDS are labelled.

Répartition de l'Effraie du Cap *Tyto capensis* en Gauteng (modifiée afin d'exclure les CQD avec <50% de surface à l'intérieur de la province), Afrique du Sud, pendant la période 2002–11. Les CQD vides prioritaires sont marqués.

the Johanna Jacobs Private Nature Reserve (along the Rietspruit east of Orange Farm). Neither protected area shows evidence of active conservation management, but if fire and grazing were to be managed, the potential for restoring tall rank grassland required by Grass Owls exists.

Westonaria QDS has very limited potential to support Grass Owls. While the farms Cardoville 364 IQ and Kalbasfontein 365 IQ in the south-east merit more comprehensive surveys, this QDS has been extensively transformed by cultivation and gold mining (at least ten mines with associated rock dumps and slime dams have been developed in the QDS). The area around the Wonderfonteinspruit, previously the largest wetland system in the QDS, was abandoned due to the formation of sinkholes in the local dolomitic compartment, a consequence of decades of active dewatering by gold mines to facilitate underground mining operations. Dewatering together with canalisation of the river has so affected the local hydrology that most of the original wetland habitat in the

north of the QDS, including several large pans, has effectively been destroyed.

Cultivation is the main cause of land transformation in Klipdrift QDS, but an extensive network of non-perennial streams and associated grassland remains, and this QDS therefore has good potential to support Grass Owls provided that grazing and fire-management regimes are conducive to the development of tall, rank grassland. Urbanisation is encroaching on Meyerton QDS from the west, but extensive areas of suitable Grass Owl habitat still potentially exist along the Suikerbosrand River and the numerous non-perennial streams in this QDS. Two protected areas (i.e. the south-west portion of Suikerbosrand Nature Reserve and the Gert Jacobs Private Nature Reserve) also offer potential refuges for this species in an otherwise intensively cultivated landscape.

Grass Owls were recorded breeding in nine QDS in Gauteng prior to 2002 and in 11 subsequently (Table 2). Recent confirmation

Table 2. Summary of African Grass Owl *Tyto capensis* breeding records for Gauteng province, South Africa.

Tableau 2. Aperçu des données de nidification de l'Effraie du Cap *Tyto capensis* pour la province de Gauteng, Afrique du Sud.

| QDS | Pre-2002 | 2002–present | |
|--------|-----------|--------------|-----------|
| | Confirmed | Confirmed | Suspected |
| 2527DC | | 1 | |
| 2527DD | 2 | 1 | |
| 2528CC | 3 | 5 | 2 |
| 2528CD | 1 | 5 | |
| 2528DC | 2 | | |
| 2528DD | | 1 | 1 |
| 2627BA | 1 | 1 | |
| 2627BB | 10 | | |
| 2627DB | 1 | | |
| 2628AA | 6 | 1 | |
| 2628AB | | 1 | 1 |
| 2628AC | | 3 | 1 |
| 2628AD | 3 | 9 | |
| 2628BC | | 5 | 3 |

of breeding in Bronkhorstspuit (2528DC), Roodepoort (2627BB) and Vereeniging (2627DB) QDS is lacking, but despite extensive habitat transformation, local Grass Owl populations persist in each of these areas and nests are unlikely to be found except by comprehensive surveys during the breeding season.

Superficially, the extent of occurrence, area of occupancy and breeding range of Grass Owls in Gauteng do not appear to have changed significantly when compared to broad historical distribution patterns, with only four obvious survey gaps identified at the QDS scale. Finer-scale modelling of remaining patches of potentially suitable habitat across the province (Whittington-Jones & Compaan in prep.), however, clearly demonstrates the fragmenting effects of cultivation, mining and urbanisation on the potential occurrence of Grass Owls in Gauteng.

While good population data are generally lacking for this species, the Grass Owl was historically considered a locally common resident in the broader Gauteng region (e.g. Markus 1964, Tarboton 1968), but is now rarely encountered and

increasingly absent from areas (e.g. Darrenwood Dam) where it formerly bred (Davidson & Biggs 1974). Such local extinctions tend to be masked at the QDS scale by the persistence of Grass Owls in increasingly isolated pockets of remnant habitat, but the species is undoubtedly experiencing a widespread and ongoing decline in the province.

In the face of ever-increasing human pressure, adherence to and refinement of high-resolution land use planning tools such as provincial conservation plans (e.g. Compaan 2011) and the cross-boundary integration of such plans and associated conservation interventions is critical if a viable network of remaining Grass Owl habitat is to be conserved. The negative impacts of habitat fragmentation are further exacerbated by ill-timed and too-frequent fires, and incompatible livestock grazing regimes over much of the province, while there is an urgent need to develop and implement sound habitat management guidelines that will promote 'owl-friendly' farming practices.

Acknowledgements

An analysis of this nature would be impossible without the assistance of numerous individuals, too many to name individually, who contributed their observations. However, particular thanks are due to those individuals and organisations who contributed large datasets, including the coordinators of and participants in the various survey and monitoring projects of the Animal Demography Unit, Tahla Ansara-Ross, Andre Botha, Paul Jooste and Matt Pretorius (all affiliated to the Endangered Wildlife Trust), Richard Koko, Jacob Makola, Aron Matabane, Wilson Molaba, Job Motsamai and Andries Mphuti of the Gauteng Directorate of Nature Conservation, Tamar Cassidy of the Ditsong National Museum of Natural History, Nicci Wright of FreeMe Rehabilitation Centre, Kevin Ravno of Natural World, Kevin Shaw of Cape Nature, as well as Rihann Geyser, Geoff Lockwood, Alan Kemp and Warwick Tarboton. The Gauteng Department of Agriculture and Rural Development is thanked for creating a work environment in which this research was possible. Alan Kemp and Ara Monadjem commented on the submitted draft of this paper.

References

- Ansara, T. 2004. Determining the ecological status and possible anthropogenic impacts on the Grass Owl (*Tyto capensis*) population in the East Rand

- Highveld, Gauteng. MSc. thesis. Johannesburg: Rand Afrikaans University.
- Barnes, K. N. 2000. Grass Owl. In Barnes, K. N. (ed.) *The Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland*. Johannesburg: BirdLife South Africa.
- Compaan, P. C. 2011. Gauteng Conservation Plan Version 3 (C-Plan 3). Unpubl. Tech. Rep. for the Gauteng Department of Agriculture and Rural Development.
- Davidson, I. H. & Biggs, H. C. 1974. Grass Owl chicks: weight recordings. *Ostrich* 45: 31.
- Gauteng Department of Agriculture, Conservation & Environment (GDACE). 2004. *Gauteng State of Environment Report*. Johannesburg: Gauteng Provincial Government.
- Harrison, J. A., Underhill, L. G., Herremans, M., Tree, A. J., Parker, V. & Brown, C. J. (eds.) 1997. *The Atlas of Southern African Birds*. Johannesburg: BirdLife South Africa.
- IUCN. 2001. *IUCN Red List Categories and Criteria: Version 3.1*. Gland & Cambridge, UK: IUCN Species Survival Commission.
- Jooste, P. 2003. Nashua Central Owl Project. *Gabar* 14: 17–22.
- Kemp, M. I., Kemp, A. C. & Tarboton, W. R. 1985. *A Catalogue of the Birds of the Transvaal*. Pretoria: Transvaal Museum & Transvaal Nature Conservation Division.
- Markus, M. B. 1964. An annotated list of the birds of Pretoria City. *South African Avifauna Ser.* 18.
- Mendelsohn, J. M. 1989. Habitat preferences, population size, food and breeding of six owl species on the Springbok Flats, South Africa. *Ostrich* 60: 183–190.
- Mendelsohn, J. M. 1997. Grass Owl *Tyto capensis*. In Harrison, J. A., Underhill, L. G., Herremans, M., Tree, A. J., Parker, V. & Brown, C. J. (eds.) *The Atlas of Southern African Birds*. Vol. 1. Johannesburg: BirdLife South Africa.
- Steyn, P. 1982. *Birds of Prey of Southern Africa*. Cape Town & Johannesburg: David Philip.
- Tarboton, W. R. 1968. *Check list of Birds of the South Central Transvaal*. Johannesburg: Witwatersrand Bird Club.
- Tarboton, W. R., Kemp, M. I. & Kemp, A. C. 1987. *Birds of the Transvaal*. Pretoria: Transvaal Museum.
- Whittington-Jones, C. A. 2010. Monitoring of the African Grass-Owl (*Tyto capensis*) and Marsh Owl (*Asio capensis*) on Suikerbosrand Nature Reserve extension, Gauteng, South Africa: 2006–2009. *Gabar* 21: 8–19.
- Whittington-Jones, C. A., Lockwood, G., Pretorius, M. D. & Kemp, A. 2011. Monitoring of the African Grass-Owl *Tyto capensis* on the Suikerbosrand Nature Reserve northern extension, Gauteng, South Africa: 2010–2011. *Gabar* 22: 19–27.
- ^a Gauteng Directorate of Nature Conservation, PO Box 8769, Johannesburg, 2000, South Africa. E-mail: craig.whittington-jones@gauteng.gov.za
- ^b Animal Demography Unit, Dept. of Zoology, University of Cape Town, Rondebosch, 7701, South Africa.

Received 14 August 2012; revision accepted 7 November 2012.